SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY

February 1st, 1935

President—W. M. MOLLISON, M.Chir.

Discussion on the Treatment of Chronic Infection of the Nasal Accessory Sinuses

Management of Chronic Sinus Disease—Conservative or Radical?

By FERRIS SMITH (Grand Rapids, Michigan, U.S.A.)

A VOLUMINOUS literature, accumulated from all civilized countries of the world, brings us to practical agreement as to the treatment of the acute and subacute processes, but leaves us divided as to the proper management of the chronic condition. It again divides us into " conservatives " and " radicals ", with the large majority in the former camp.

It must be understood that I am not discussing the subacute or early chronic cases in which the condition will yield to well chosen intranasal and systemic medication. Nor do I include that group of cases which will yield to medication after conservative surgical treatment intended to permit proper drainage and ventilation. I am, on the contrary, discussing that large group in which the condition has resisted sufficient intelligently applied intranasal treatment to effect a cure, and in which the pathological changes are of such a nature and so advanced that no type of management can effect a return to normal. This, moreover, includes the numerous groups of cases in which one or many intranasal operations have been performed without relief of symptoms. This discussion will be limited to the upper group (fronto-ethmo-sphenoid) of sinuses, although the principles involved apply equally to the maxillary sinus, except as to operative technique.

It seems to me that the so-called " conservatism " results, primarily, from a difference of opinion as to what mucosa and how much of it to remove, plus the lack of surgical technique which permits satisfactory treatment and, at the same time, produces no cosmetic disability. The conservatives see possible or imaginary

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

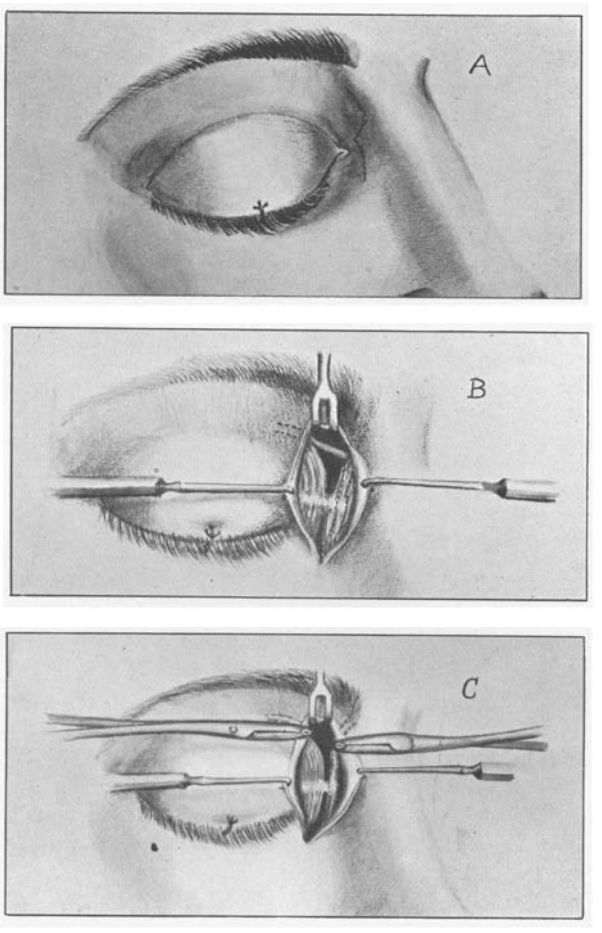


FIG. 1.

In A., the dotted line indicates the skin incision; the lids are closed by a horsehair suture; B., shows the exposure of the superior palpebral vessels; C., division and ligation of the superior palpebral vessels.

[face p. 604

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

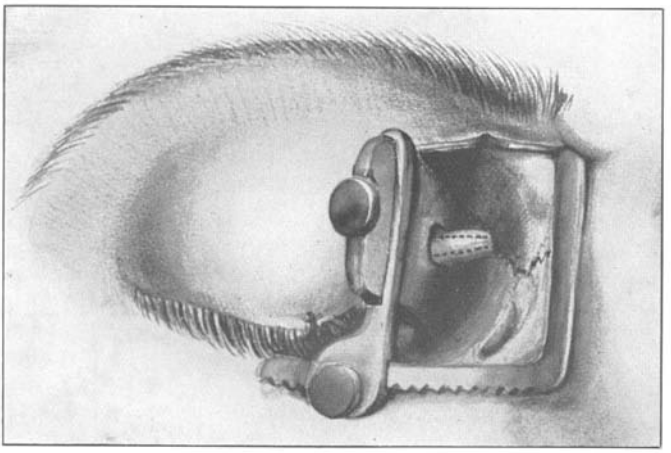


FIG. 2.
The periorbita is separated from the lamina papyracea and the frontal floor. The posterior ethmoidal vessels and nerve are exposed.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

functions of these cavities destroyed, even though they are unable to assign any function to them. They are satisfied with an outcome so incomplete that it frequently fails to approach a clinical cure.

It may be well to define what is meant by a *cure*. The ideal cure obviously demands the restoration of normal condition of function, but this is too much to expect in any long-standing infectious process. It can be closely approximated, however. *A clinical cure* demands the complete removal of the underlying pathological condition, with the minimum disturbance of function and the preservation of the normal appearance of the patient. It presupposes the complete eradication of infection, with its remote signs and symptoms and the absence of local manifestations.

The problem of meeting these requirements, either medically or surgically, has not been simple. This has been due partly to the anatomical location of the disease and the disinclination of both the patient and the physician to undertake the necessary management, and partly to the failure of the physician to appreciate properly the underlying pathological condition. These factors have been augmented by the teachings and dicta of practitioners in positions of authority who have constantly counselled " conservative measures " in attacking diseased sinuses, despite their unsatisfactory results, and by the constant advice " to remove only the obviously diseased portions " of the lining of one sinus and not to disturb the lining of another sinus because of possibilities which are far more imaginary than real.

No one is endowed with microscopic vision and consequently one can depend only on gross pathological evidence in making such an ill-advised selection of tissue for removal. I have examined the linings of several hundred sinuses of these types and have never found a section which was fit for retention.

The late Ross Skillern,[1] who may be considered a leader of this conservative majority, in a paper entitled " The Ethmoid Problem ", published in 1927, expressed the prevailing attitude. He urged an ultra-conservative management. He pointed out that the prevaling management of chronic disease of the ethmoid sinus was a failure, and he advocated a method which depended on ventilation and drainage for its result. He traced the unfavourable outcome of long-continued local therapy by the attending surgeon. He noted that the patient complained of the lack of progress and that the physician

" permitted his feelings to prejudice his better judgment, and with the hope that fathered the conviction, flew to surgery oft-times, I am sorry to say, widespread and haphazard, with the result of which all of us are, or have been, intimately familiar. As I say, once upon a time extensive

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

surgery—that is, an *attempted complete intranasal exenteration* of the ethmoid—was indicated when this impasse between the ethmoid infection and the attending surgeon prevailed."

"We have learned that by applying surgery we have only been co-habiting with chimeras and begetting spectres, for who, indeed, has ever contemplated an ethmoid some months after a *so-called complete exenteration*, with its conglomerate mass of hypertrophied and scarred mucosa, fibrous tissue, and bone bathed in pus and carpeted with crusts, that has not, indeed, seen a spectre, and a very horrid one at that, particularly if he himself had performed the operation ?"

Skillern, in these paragraphs, vividly and accurately described the picture of an incomplete operation, leaving residual infected membrane and bone. He wrote later in the same paper, as follows :

"I am also quite aware that even with this structure (uncinate process) out of the way the *entire ethmoid labyrinth cannot be removed endonasally*, but as a matter of fact that is almost never indicated, as all the cells are not always affected, at least to the same extent as to require complete exenteration."

"It will be seen that to resort to extensive surgery at this time with the hope of radical cure is the acme of fatuity, but something must be done, and very quickly at that, if we hope to retain the confidence of our patient."

What a legion of changes in attitude has occurred since Woakes[2] read his famous paper in this city in 1885, calling attention for the first time to the association of nasal polypi with ethmoid disease !

The last statement of Skillern applies equally to all of the sinuses of this group. The "change" that he recommended is the removal of the middle turbinate to improve ventilation and drainage in an intact ethmoid capsule, and local treatment with a strong solution of mild silver protein. Such treatment may be adequate in certain cases of hyperplasia in which the cells are still air-containing. It is absurd to attempt to cure, by such a conservative measure, a sinus containing an old pyogenic membrane or one walled with diseased bone.

It is plausible that the establishment of proper mechanical and physiological conditions may well restore to normal a sinus lining that is the site of simple œdema, subacute or chronic inflammation of the epithelial structure and the superficial layers of the tunica propria, or even the early hyperplastic states that are characterized by early formation of polypi. On the other hand, it is hardly conceivable that the establishment of drainage through the ostium, or even more extensive drainage with added irrigation, ventilation and medication, can materially affect some of the more marked chronic pathological conditions. I have in mind multiple cysts, multiple abscesses in the deep layers, periostitis and extensive

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

chronic inflammation of all layers with glandular hyperplasia, marked fibrosis and polypoid changes. Practically all the normal structure has been replaced in many of these cases, and one could only hope to obtain replacement of the diseased lining by scar tissue. This would be acceptable if there were no isolated pockets of disease to maintain the symptoms. Unfortunately such extensive pathological processes are frequently characterized by invasions of trabecular bone which resists all treatment other than removal.

In an extensive experience, I have never failed to find bacteria in these chronically diseased sinus linings. They are common in the sub-epithelial areas in the early chronic cases and are always found about the glands and vessels and in the reticular spaces in the old cases. One frequently finds periostitis and osteitis to account for the recurrent symptoms after incomplete removal of the diseased tissue. Pure cultures are seldom found. Streptococci are almost invariably present, the green and the hæmolytic strains being about equally frequent. The commonest accompanying organisms are the pneumococcus and the *Micrococcus catarrhalis*.

With these facts in mind it is well to inquire as to what should be considered " radical " treatment and at what point " conservative " treatment is no longer compatible with sound judgment. The term " radical " has been, and is, unfortunate in that it prevents the majority of operators from considering their problem with understanding and fully meeting its requirements. Intolerance has been the greatest enemy to progress since the beginning of civilization. It is time that the rhinologist should forget his prejudices and abandon the many intranasal and so-called " conservative-radical " procedures which do not permit him to operate under direct vision, and constantly preclude adequate and thorough accomplishment of the purpose of the management. In many cases, no operator, however skilful, using these intranasal methods, can enter all of the ethmoid cells, nor would anyone be so bold as to claim more than increased drainage in a frontal sinus. He cannot remove safely the pathological linings of the superiorly placed ethmoid cells or the diseased tissue about the cribriform plate. The failure to do this spells disaster in some instances and continuance or recurrence of the symptoms in most of these cases. We cannot continue to treat the sphenoid sinus " conservatively " with a full knowledge of the complications described by Pickworth,[3] and Turner and Reynolds.[4] *The rhinologist frequently attempts to complete, with post-operative treatments in his office, that which he should have accomplished in the operating room.* He must follow some procedure which permits him to see clearly every vestige of diseased tissue and to deal with it accurately and safely. This must be accomplished without deformity and with neither functional nor cosmetic disability. Such

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

a procedure demands a direct approach and a practically bloodless field.

Herbert Tilley[5] pronounced many years ago the dictum that "*the ethmoid is the key situation or crossroads of the nasal sinuses and command of this situation is the most important factor in a successful attack on any or all of them.*"

All rhinologists recognize the dangers of complete removal of the diseased tissue high in the nose and prefer to discharge their patients living with incomplete removal rather than risk the fatal outcome of attempted completion. More important than this is the anatomical impossibility of reaching the whole of the involved area by the intranasal approach.

Would it not be safer, saner, and evidence of better judgment, to approach such a situation directly in a practically bloodless field which is under full vision, than to follow the common practice of attempting to work from below upwards into a dangerous area in the presence of more or less free bleeding and with the certainty that the most skilled effort cannot thoroughly clear the area of disease ?

The former type of operation almost invariably produces a satisfactory result when the various details are scrupulously observed. There is a minimum of risk and inconvenience, the procedure is painless and practically bloodless, the field may be rendered scrupulously clean, the convalescence is comfortable and brief, and there are no permanent disabilities and rarely any recurrences of the original complaint.

Jansen,[6] as an assistant in the clinic of Lucae, 1894, described the cardinal principles and technique of this procedure. Ritter,[7] twelve years later, described a technique which is practically identical. Neither of these procedures apparently appealed to the rhinologists of the world. Knapp,[8] in 1899, described in detail the successful management of a group of cases by this method, but this made only a transitory impression. It remained for the late Robert Lynch,[9] of New Orleans, to become discouraged with the accepted management of chronic sinus disease and to adopt the technique described by Knapp as originating with Jansen. He made some refinements in it and undertook a vigorous campaign of education among his friends and colleagues. He based his claims on a considerable series of results of his own and of his friends. He did more than any other person to arouse an interest in this method of complete management. Sewall[10] published an excellent survey of the entire situation in 1926 and clearly described the existing technique, with the addition of several essential refinements. He described a method of ligating the ethmoid and sphenopalatine vessels so as to render the intranasal field practically bloodless.

I have made some additions to the procedure and developed instruments to expedite its execution.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

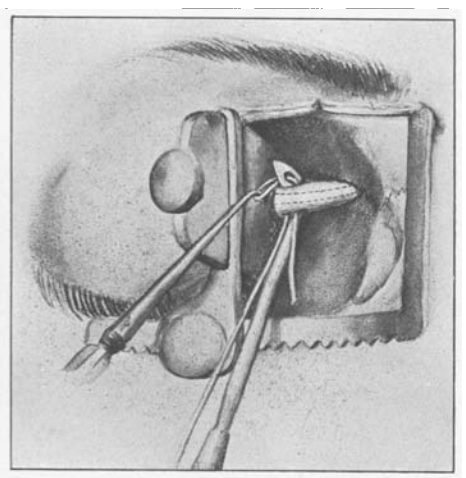


Fig. 3A.

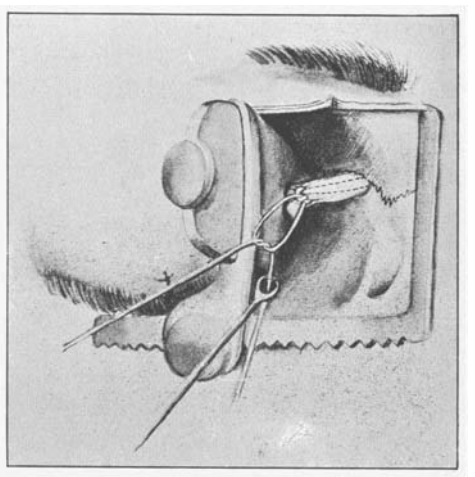


Fig. 3B.

ı. shows ligation of the posterior ethmoid vessels. A needle, carrying 0 catgut, has been passed through he periorbita posterior to the vessels, and the suture is being recovered by a sharp hook. In B., the catgut knots are tied outside into position with a slotted ring.

[*face p.* 608

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

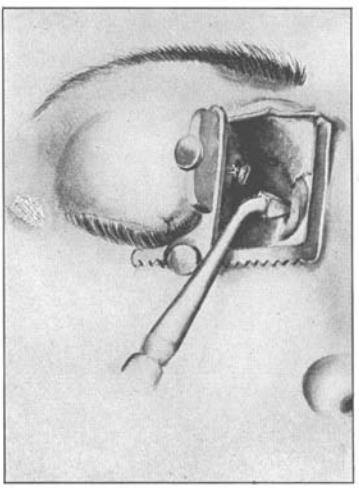


FIG. 4A.

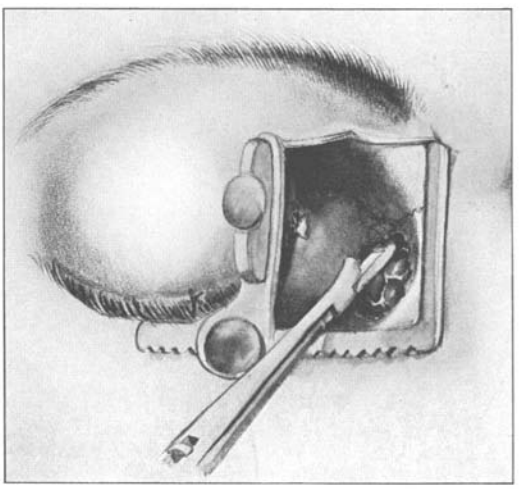


FIG. 4B.

A. shows perforation of the lamina papyracea to admit a punch forceps; B., removal of the lamina papyracea with the punch forceps.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

Technique

All the sinuses on one side may be operated on during one period.

The evening before operation the patient is given pentobarbital sodium. This is repeated one hour before operation in the morning or the patient is given a hypodermic injection of morphine sulphate, $\frac{1}{6}$ gr. (0·01 gm.) and scopolamine hydrochloride, $\frac{1}{150}$ gr. (0·43 mg.).

The face is cleansed with soap and water, painted with 3 per cent. iodine and finally sponged with alcohol to remove the iodine. A black helmet, which exposes only the operative field, is drawn over the face and head and fastened with strings about the neck. This draping absorbs the light about the operative field and increases the illumination in the depths.

The side of the nose to be operated on is packed with cotton pencils wrung out of a solution of epinephrine hydrochloride (1: 2,000) containing 10 per cent. of cocaine. The area of the incision about the inner canthus of the eye is infiltrated with a solution of 2 per cent. procaine hydrochloride containing 25 minims (1·5 c.cm.) of epinephrine hydrochloride to the ounce (30 c.cm.). Two or three drachms (from 7 to 11 c.cm.) of this solution is sufficient.

The eyelids are closed by a horsehair suture passed through the marginal skin of the upper and lower lids. This protects the cornea from damage by sponges and instruments. The dotted line in Fig. 1A indicates the incision in the skin. This should begin immediately below the eyebrow. The incision should be about $\frac{3}{4}$ in. (1·8 cm.) long and terminate $\frac{3}{8}$ in. (0·9 cm.) below the canthus. It should be staggered or off-set at its mid-point to prevent scar elevation.

The elevation of the skin and fascia on either side of the incision exposes the apposition of the orbicularis palpebrarum and quadratus muscles (Fig. 1B). These are separated in order to expose the superior palpebral vessels which branch from the angular vessels in the quadratus muscle. At this point the internal canthal ligament is seen.

The superior palpebral vessels are incised between two forceps and ligated with 00 plain catgut (Fig. 1C). The incision is carried through the periosteum to the bone. The periosteum is elevated on the lateral side of the incision until the ligaments about the lachrymal sac are exposed. These are incised, and the sac is turned outwards and downwards until the duct is exposed in the floor of the fossa.

The periorbita is freed by an elevator from the entire lamina papyracea and the floor of the frontal sinus. Care must be exercised not to tear the periorbita along the fronto-ethmoid suture, to which it is frequently firmly attached.

This elevation exposes the posterior ethmoidal vessels and the nerve sheathed in the periorbita which is firmly attached about the

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

posterior ethmoid foramen. I disregard the anterior ethmoidal vessels because I have never seen more than two or three drops of bleeding from their section in several hundred cases.

A self-retaining tractor with a slotted blade of proper size (Fig. 2) is passed over the posterior ethmoidal vessels and opened to expose the entire lamina papyracea. This traction puts the sheaths of these vessels on tension and makes their ligation a simple procedure.

At this point cotton-wound applicators wrung out of 10 per cent. cocaine solution are applied for a few moments above and below the sheath to anæsthetize the posterior ethmoid nerve. A right-angled Yankauer needle, carrying No. 0 plain catgut, is passed through the sheath posterior to the vessels and close to the retractor. The end of the suture is recovered with a sharp hook (Fig. 3A). The knots are formed outside the orbit, and passed into position by a slotted ring tier (Fig. 3B). The vessels are ligated by the method described by Sewall and incised at the bony foramen. The distal ends rarely bleed more than a few drops, but in the most troublesome case the bleeding may be controlled by a few moments' pressure with a gauze sponge.

The mesial orbital wall is perforated through the lachrymal fossa or immediately behind it with a sharp perforator large enough to admit punch forceps, with which the opening is further enlarged (Fig. 4A). With specially designed heavy punch forceps enough of the posterior margin of the nasal process of the maxilla is removed to permit complete exenteration of the lining of the most anterior cell and afford a clear view.

The lamina papyracea is now removed with Grünwald punch forceps (Fig. 5A), leaving a wall $\frac{3}{16}$ in. (0·45 cm.) high along the orbital floor when the condition of the bone permits. The same forceps introduced through the nostril removes the major portion of the ethmoid cells and leaves the lateral wall of the middle turbinate clearly exposed.

A Sluder ethmoid knife is now gently inserted between the septum and the middle turbinate, and raised to the level of the cribriform plate. It is turned laterally to fracture the turbinate slightly towards the orbital wall. The punch forceps is introduced with the female blade along the cribriform plate, and the middle turbinate is punched away without tugging or tearing. The bevel of the female blade of the forceps protects the cribriform plate from damage.

The complete removal of the middle turbinate has exposed the entire anterior wall of the sphenoidal sinus. The remnants of the ethmoid cells are completely removed with punch forceps, and the nasal roof (fovea frontalis) is *completely* freed from covering membrane by the use of small gauze balls instead of metal curettes. *Every*

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

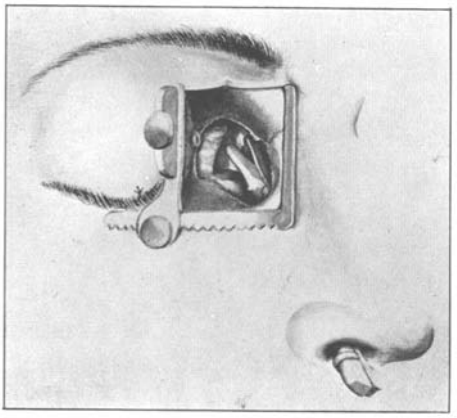


Fig. 5A.

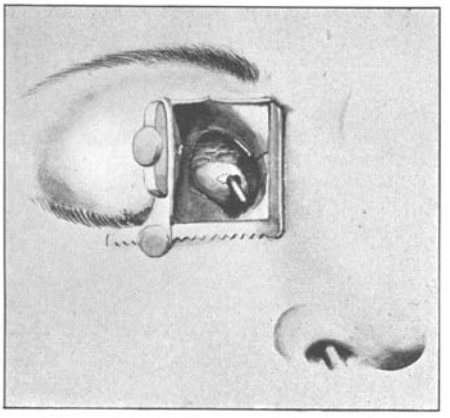


Fig. 5B.

In A., the lamina papyracea and the ethmoid labyrinth have been removed; the middle turbinal is being removed by a punch forceps. In B., the ethmoid foveae in the frontal bone are seen along the nasal roof; the anterior wall of the sphenoid sinus is exposed; a hook knife is enlarging the sphenoid ostium.

[*face p.* 610

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

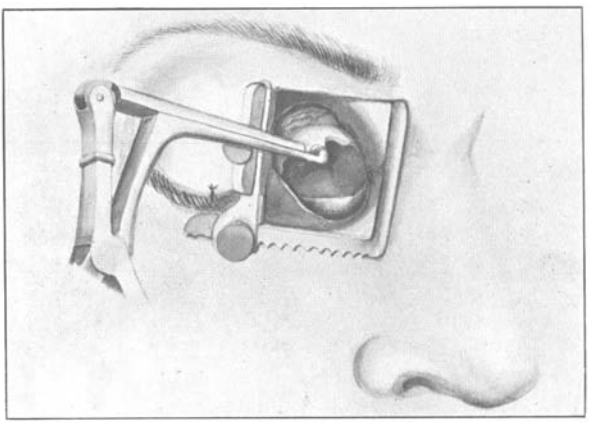
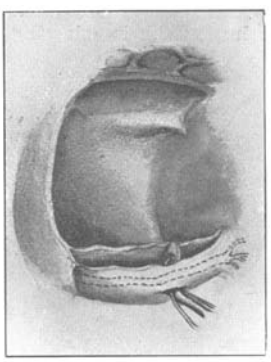
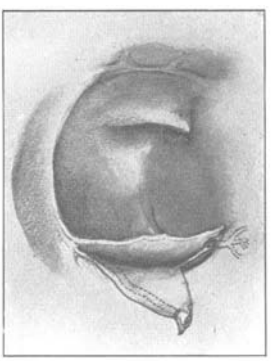


FIG. 6.
The anterior wall of the sphenoid sinus is being removed by a punch forceps passed through the orbital opening.





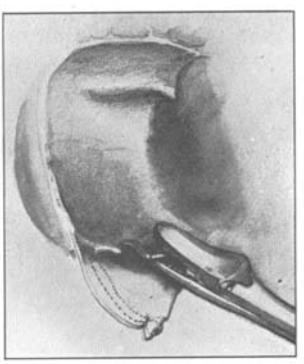


FIG. 7A. FIG. 7B. FIG. 7C.
A. shows ligation of the sphenopalatine vessels near to the vomer; B., the formation of a muco-periosteal flap to expose the bony floor of the sphenoid cavity; C., removal of the bony floor with a heavy punch forceps.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

vestige of membrane must be cleared away and the bone left scrupulously clean. Any adherent shreds will be freed by a solution of 5 per cent. trinitrophenol in 35 per cent. acetone, which is thoroughly applied to the entire operative area.

One now deals with the sphenoid sinus. A Sluder knife is introduced into the ostium and the opening enlarged laterally to admit punch forceps (Fig. 5B). Only once in several hundred cases have I found it necessary to use a chisel to enter this sinus.

The anterior wall is completely removed from the roof to a point about $\frac{3}{16}$ in. (0·45 cm.) above the floor (Fig. 6). The punch forceps should be introduced through the orbital opening and held parallel with the nasal roof in removing the superior portion of this wall. If it is introduced at an angle through the nostril, the distal blade will lie high in the dome-shaped roof of the cavity and part of the cranial floor will be removed.

The mucoperiosteum containing the sphenopalatine vessels is now separated from the lower remnant of the wall (Fig. 6) preparatory to the removal of as much of the floor as possible.

A Yankauer needle carrying No. 0 plain catgut is passed behind the vessels near the nasal septum (Fig. 7A). The ligature is recovered with a sharp hook and tied as described for the posterior ethmoidal vessels. This ligation may be easily accomplished with the author's automatic needle (Fig. 13).

A flap of mucoperiosteum is formed by carrying an incision backwards and slightly outward from the nasal septum. This flap is separated from the floor of the sinus (Fig. 7B). The floor is removed until the remaining portion, together with the posterior wall describes a parabola directed into the nasopharynx (Fig. 7C). This is frequently difficult, and sometimes impossible, to accomplish with any type of punch forceps. It can always be accomplished with a motor-driven crosscut burr.

The lining is now *completely* removed with a dull separator and small balls of gauze. If the membrane is resistant, as is frequently the case, the cavity is packed for a few minutes with gauze soaked in the trinitrophenol solution, after which the membrane is readily separated. The only exception is the membrane in pterygoid pneumatizations, of which I have seen sixteen examples in more than five hundred cases. The flap is folded over the remaining portion of the floor to furnish a lining and prevent granulation on the cut edge (Fig. 8B). If the basilar process and articular process of the occipital bone are the site of an infection or an osteomyelitis, this area is treated exactly as one treats a long bone under similar circumstances. The author uses a burr or a twist-drill to cut a channel to the superior cortical wall. The burr is introduced through the nostril and controlled under direct vision through the orbital opening (Fig. 8C).

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

In two cases of involvement of the sphenoid only, with complicating basilar congestion and meningismus, the velum has been split along its median raphe from the palatal bones to the base of the uvula to afford access to the basilar process. Approximately $\frac{3}{8}$ of an inch (0·9 cm.) has been removed from the posterior margin of the palatal bones to permit the drill to be introduced through the mouth at a proper angle.

The frontal sinus is now entered in the region of its normal opening and the *entire* floor removed with punch forceps and rongeurs (Fig. 9). The angle formed by the junction of the two tables is bevelled, so that no crevices remain. The lining and the posterior bony wall are treated in the same manner as in the sphenoid sinus.

Only rarely has it been necessary to enlarge the incision in the soft parts laterally to permit access to the most extensive sinus. I recognize the existence of frontal sinuses which extend laterally to the malar process, and one would, in such instances, be forced to extend the incision to meet the requirements of a completed operation.

Two points of importance remain. The lining in moderately or abnormally high anterior portions of the sinus may be thoroughly removed without interference with the anterior wall. The cavity is packed with gauze saturated with the trinitrophenol solution for a few minutes to loosen the membrane, regardless of its thickness. Frequently, when fibrosis is marked, the membrane may be removed *en masse*. In any event, it may be scrubbed out with small gauze balls soaked in the solution and used as a curette. I do not believe that the sharp curette has any place in this procedure. Final inspection with a mirror should reveal scrupulously clean bony walls.

Finally, a *proper drainage duct for the unobliterated portion of the sinus* must be maintained. The attempt to accomplish this with obturators and long-continued sounding is futile in most instances. Bárány utilized for this purpose a flap taken largely from the upper portion of the septum to cover a portion of the exposed periorbita. The procedure is difficult, uncertain, mutilating, and usually inefficient. Sewall recommended the preservation of mucosa immediately mesial to the opening in the bone anterior to the lachrymal fossa. This flap is frequently inadequate in size and consists of membrane which should be removed.

I prefer to introduce a flat, inflatable rubber pad (Fig. 12B) into the defect left by removal of the lamina papyracea and cover it to a point above and below the opening in the bone with a Thiersch graft (Fig. 10A) taken from the arm or the thigh. The pad is smeared with petrolatum, and the skin, raw surface externally, is wrapped around its lateral and anterior walls. The pad is then inflated to

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

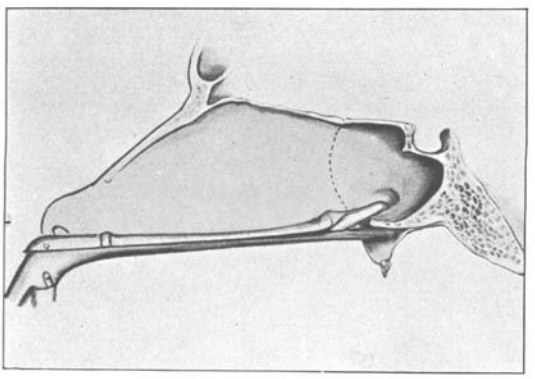


Fig. 8A.

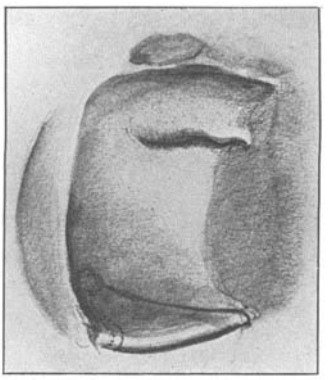


Fig. 8B.

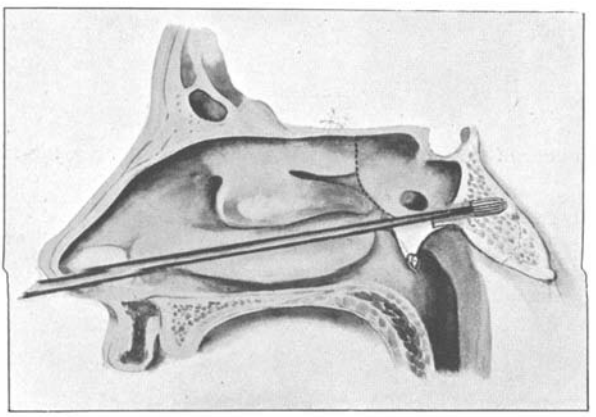


Fig. 8C.

A. shows a lateral view of the removal of the bony floor of the sphenoid cavity. In B. the muco-periosteal flap is reflected over the remaining bony floor. In C., a burr is introduced through the nostril and carried to the superior cortical wall.

[*face p.* 612

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

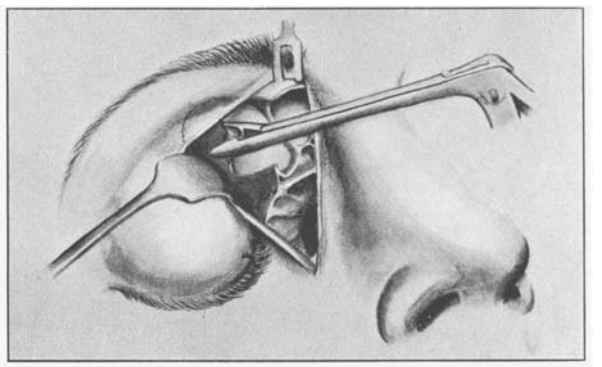


FIG. 9.
The floor of the frontal sinus is removed with a punch forceps.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

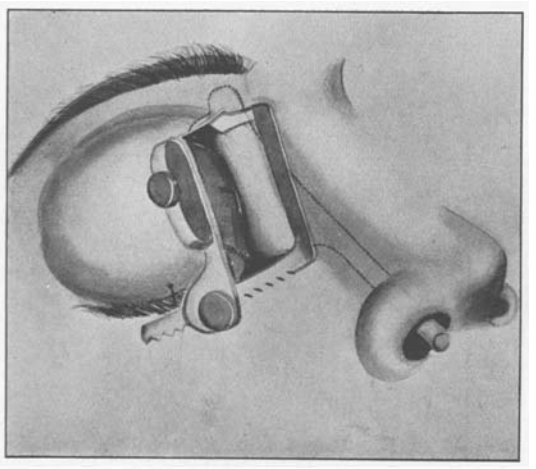


FIG. 10A.

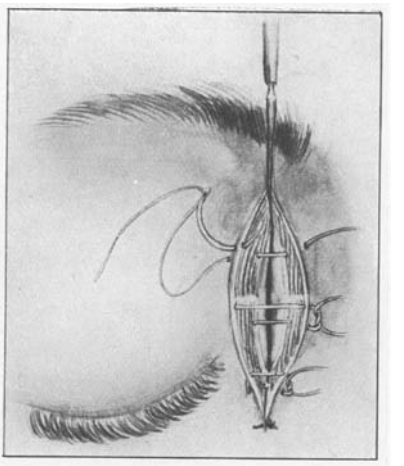


FIG. 10B.

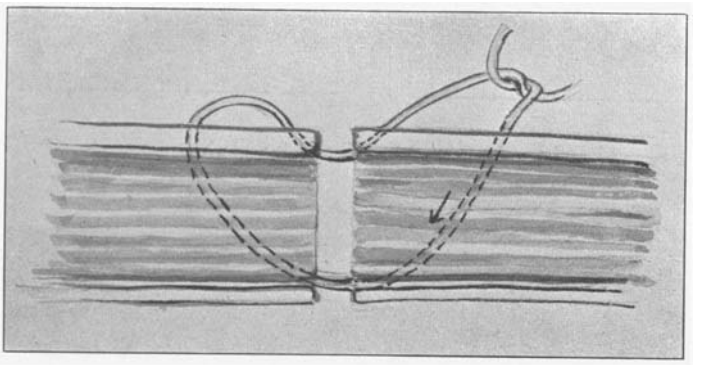


FIG. 10C.

A. shows a skin graft supported by an inflatable rubber pad (Fig. 12B.) to form an epithelialized frontal duct; B., closure of the periosteum, muscle and skin with vertical mattress sutures of horsehair: C., the detail of a suture.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

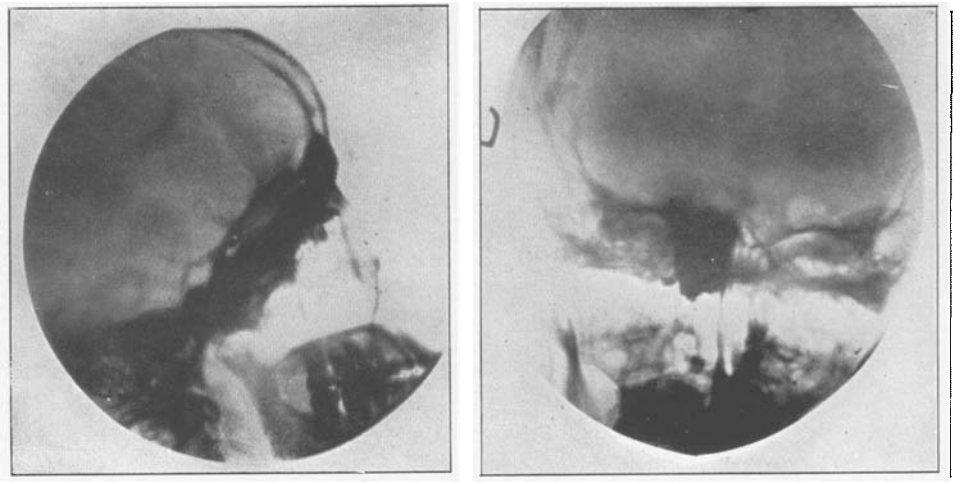


FIG. 11.
Lateral and anterior views of the extent of the operative field.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

produce a gentle pressure against the periorbita. Deep horsehair sutures are passed through the skin and muscle to approximate the soft parts to the graft. The graft adheres to the underlying muscle and periorbita and prevents the adhesion of these structures to the margins of the bone. I have found occlusion of the duct in only sixteen cases. This resulted from contraction of a small graft placed around a rubber tube.

Deep horsehair sutures are passed through the skin and muscle to approximate the soft parts to the graft (Fig. 10B). Vertical mattress sutures (Fig. 10C) are employed to accomplish approximation of both the muscle and the skin. These are removed on the third day, and the skin is supported by a gauze strip applied with collodion. No intranasal dressings are applied, nor is the wound disturbed in any way until the fifth day. At this time secretion is removed by gentle suction which avoids the denuded areas of bone. Only a few days of such care are required until the patient is discharged and permitted to complete his own management.

This type of management is not applicable to patients who present marked involvement of the tables of the skull forming the walls of the frontal sinus. Such patients require the more extensive, deforming operation described by Killian and Krauss.[11]

A few specially designed instruments, in addition to the Hajek and Grünwald punch forceps and the various bayonet-shaped rongeurs found in a rhinological surgeon's equipment, are sufficient for the accomplishment of this operation.

Self-retaining retractors (Fig. 12A) designed for the right and left sides, and fitted with two widths and lengths of slotted blades, facilitate the work. Such retractors make it unnecessary to have an assistant in performing the operation and prevent the trauma resulting from the frequent adjustment of hand retractors.

Specially designed, heavy punch forceps of a proper length to permit use in the sphenoid cavity (Fig. 12C) render the removal of the heavy bone of the nasal process of the maxilla simple, and unannoying to the patient. Chisels and mallets find no place in this technique. These forceps readily remove the anterior wall of the sphenoid sinus regardless of its condition. The heavy Grünwald type of punch forceps is useful in removing the floor of the sphenoid sinus. The sponge-carrying forceps are designed for the clearing of the high anterior portion of the frontal sinus. Small gauze balls soaked in trinitrophenol solution are employed for scrubbing, in place of the usual curettage.

Comment

I have operated on more than five hundred patients by this method.[12] Dehiscences of varying size were noted in the sphenoid sinuses of seventeen patients and congenital absence of the cribriform

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

plate on both sides in one patient. The dura pulsated freely along the entire length of a slit representing the area of the cribriform plate. I do not consider these areas of exposed dura as dangerous as the freshly exposed dura in the presence of a suppurating mastoid. They have been long in contact with the chronically infected lining of the sinus and have undoubtedly been sealed to the margins of the bone by chronic pachymeningitis.

The majority of these patients complain of post-operative headache, but never of pain. The headache persists from three to thirty days following operation; the average duration is five days. It is readily controlled with acetylsalicylic acid. There is usually a diplopia for a similar length of time. I observed a persistent diplopia in one case for a year, but have never seen permanent diplopia following this procedure.

I noted the recurrence of small polypi in five cases in this group. This is a reflection on the operator rather than on the operation. In most of these cases the cavity is free from moisture without any post-operative management, but a few resist all effort to reduce the excess of mucus. This is probably due to some metabolic disturbance rather than to residual infection. The scar resulting from the incision in the skin is hardly visible after two months. The cosmetic disability is negligible.

There have been five deaths in this series. All of them occurred in the first group of 100. Two occurred in patients with asthma of long standing, who died of sudden cardiac failure, one eight hours following operation and one twenty-six hours afterwards. One patient died of streptococcal meningitis ten hours after operation. One patient died of necrosis of the septum (vomer) with marked sepsis, and one succumbed to necrosis of the cribriform plate with secondary meningitis about six weeks after operation.

I do not feel that the two deaths from cardiac disease and the one from streptococcal meningitis can properly be charged to the surgical procedure.

Summary

(1) The generally accepted management of chronic sinus disease is unsatisfactory both to the patient and to the consultant.

(2) The rhinologist must determine at what point the so-called " conservative " management is no longer compatible with sound judgment.

(3) He must divorce himself from the bogey created by the term " radical " and consider the surgical intervention which produces the desired result as " complete ".

(4) The rhinologist must follow a procedure which affords proper relief in cases presenting local signs and symptoms, in those

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

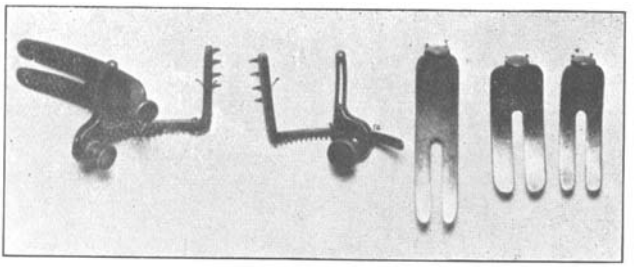


Fig. 12A.



Fig. 12B.

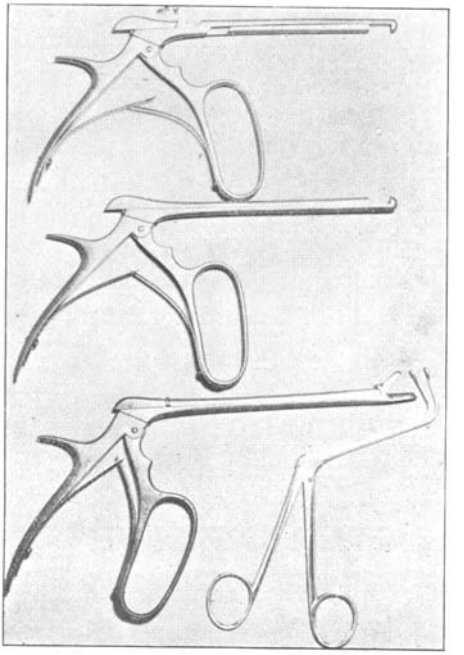


Fig. 12C.

A, shows right and left self-retaining orbital retractors with interchangeable blades of two sizes. B., flat, inflatable rubber pad for the approximation of split skin to the periorbita. C., heavy punch forceps for removal of bone, and a sponge carrier for use in the frontal sinus.

[*face p.* 614

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

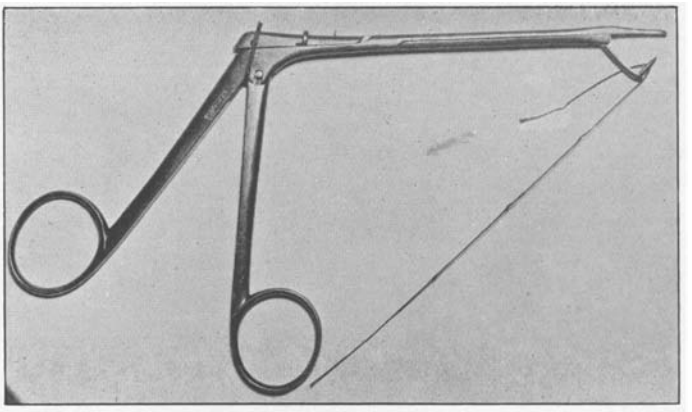


FIG. 13A.

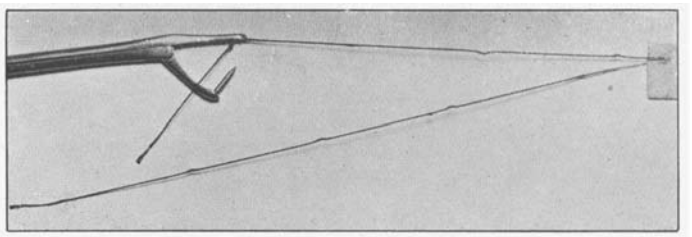


FIG. 13B.

Automatic ligating needle forceps. A., a catgut suture is held in a slotted needle. B., the closure of the alligator jaw supporting the needle carries the suture through the tissue and grasps it in the spring eye of the fixed blade.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

presenting general symptoms of chronic sepsis and in those in which secondary bronchitis and asthma are present.

(5) This operation is carried out under local anæsthesia; it produces no pain, slight bleeding, and only minor post-operative reactions.

(6) The clinical results are, in general, satisfactory.

BIBLIOGRAPHY

[1] SKILLERN, R. H., *Ann. Otol., Rhin. and Laryng.*, 1928, xxxvii., 173.
[2] WOAKES, EDWARD, *Lancet*, 1885, ii., 108, 150.
[3] PICKWORTH, F. A., *Journ. Laryng. and Otol.*, 1932, xlvii., 797-807.
[4] TURNER and REYNOLDS, "Intracranial Pyogenic Diseases," 1931.
[5] TILLEY, HERBERT, *Journ. Laryng. and Otol.*, 1932, xlvii., 816.
[6] JANSEN, A., *Arch. f. Laryng. u. Rhin.*, 1893, i., 135.
[7] RITTER, GUSTAV, *Deutsche med. Wchnschr.*, 1906, xxxii., 1294.
[8] KNAPP, A. H., *Arch. Ophth.*, 1899, xxviii., 50.
[9] LYNCH, R. C., "The Technic of a Radical Frontal Sinus Operation," *Laryngoscope*, 1921, xxi., 1; "The Technic of a Pan-Sinus Operation," *South Med. Journ.*, 1924, xvii., 289; "Ethmoidal Sinusitis: External Radical Approach," *Trans. Amer. Acad. Ophth.*, 1929, 438.
[10] SEWALL, E. C., *Arch. Otolaryng.*, 1926, iv., 377.
[11] KILLIAN and KRAUSS, *Arch. f. Laryng., u. Rhin.*, 1902, xiii., 28.
[12] SMITH, FERRIS, "Management of Chronic Sinus Disease," *Arch. of Otolaryng.*, 1934, xix., 157-71.

A. LOWNDES YATES: Chronic sinusitis indicates that state of sinus inflammation which has either not resolved, or has recurred at intervals. We realize, therefore, that the most important phase in inflammation of the sinuses is that in which it can be cured by simple measures. If we can make these simple measures adequate, and what is more important, if we can make the patient come for treatment in this early stage, major operative measures on the sinuses would be rare.

When examining a number of cases of sinusitis in which an operation had been carried out, I observed that in those cases in which the operation had succeeded, the secretion before operation had differed from that in which the operation had failed.

In the successful cases the discharge had consisted of mucopus containing leucocytes and very few epithelial cells; and organisms, if present, had been intracellular or, if free within the fluid, had been dissolved in a few hours by the bactericidal action of the mucus.

In the cases in which the operation had failed to secure stoppage of the discharge, this showed, microscopically, a few pus cells, large quantities of epithelial cells, and quantities of organisms which were not dissolved by the bactericidal action of the mucus. This second type of discharge was found in cases in which some simple procedure

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

had been carried out—such as resection of the septum—and also after radical operations if the operation had failed, but on further investigation it was found that the first type of discharge might also be present in cases in which the operation failed, if the measures used had not been sufficiently radical. Operation therefore sometimes failed because mucous membrane which could not recover, had not been removed, but in the majority of cases operation failed because the sinusitis was produced by a micro-organism to which the tissues had not efficient resistance.

I therefore turned to cases which had not been operated upon and found that the type of inflammation in which free organisms were present in the secretion was essentially different from that in which free organisms were absent.

I collected cases of both types and, by attempting different forms of treatment, proved to my own satisfaction that when free organisms were present in the discharge, palliative measures gave results superior to operative measures, but still the palliative measures at my command were not efficient, and I thought that they ought to be improved.

Before attempting to improve these measures, I carried out an investigation into the various types of sinusitis which were present, and I found that when the reaction of the tissues was high and free organisms were absent from the secretion, the ostium of the sinus was generally partially closed and that the inflammation was maintained by the obstruction. I called this form *obstructive sinusitis*.

When free organisms were present in the secretion, this seemed to be evidence that the reaction of the tissues was low. The ostia of the sinuses in these cases were generally unobstructed, and the inflammation was maintained by the ability of the organisms to survive in the secretion. I have called this *open sinusitis*.

I then measured the rate of ciliary action by injecting indigo-carmine into the sinus, and noting the rate of its removal. I measured the bactericidal power of the mucus by noting the number of organisms present on collection of the specimen, and after the specimen had been kept warm in a capillary tube for three hours.

I measured the size of the ostium by a method which depends upon the rate at which air can be drawn through the ostium into the sinus and leave the sinus by a cannula introduced into the antrum, to which cannula an aspirating pump had been attached.

I found that in *obstructive sinusitis* the cilia were active, and in early cases were able to bring about a cure if the mucous membrane at the ostium was shrunk with cocaine. In later stages of obstructive sinusitis, I found that a small opening in the inferior meatus was required to permit the patient to douche the sinus. If the opening was very large the patient could not force the douching

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

fluid through the ostium, which, being obstructed, prevented the escape of pus and thus gradually set up ethmoiditis. I also found that in the most advanced cases the mucous membrane was beyond recovery and required removal.

In *open sinusitis* I found two different conditions, namely: (1) Open sinusitis with hyperactivity of the cilia. (2) Open sinusitis with inactive cilia.

Open sinusitis with active cilia.—When the ostium is open and the cilia are active we find only small quantities of secretion in the sinus, but the ciliary tracts over which the pus passes are inflamed. The principal complaint in these cases is laryngitis, tracheitis, or bronchitis, and post-nasal catarrh is also frequently a symptom. Secretion, when examined, shows a diminished bactericidal power and this is the reason for the maintenance of the inflammation.

Open sinusitis with inactive cilia.—There is often in this condition very little evidence of sinusitis to be seen upon inspection of the nasal airway or the nasopharynx. The patient generally complains of rheumatism, neuritis, fibrositis, or toxic neurasthenia, and is sent to see if there is a site of inflammation in the nose, and frequently, by the usual methods of examination, the answer is in the negative. The secretion in these sinuses shows very low bactericidal power. While this condition is generally associated with manifestations of toxic absorption, this is not always the case, for not infrequently the mucous membrane is fibrosed and in the later stages of such fibrosis the secretion dries in the nose and forms crusts which have a fœtid odour.

In many of these cases I had been considering the ill-effects which had followed abnormalities of the nasal airway. In these it is often found that one airway does nearly all the work of removal of infection from the air which is inspired through the nose, and the other is inefficient owing to partial blockage by a deflected nasal septum. The inequality of the airway is generally combined with inequality of the middle meatus of the two sides, so that one is narrow and causes cramping of the ostia of the sinuses, while the other is too wide and exposes the mucous membrane around the ostium to too much infection, especially when the patient is in constant contact with some person who has pyorrhœa or a form of sinusitis capable of infecting others, such as exists in some varieties of open sinusitis.

I found that if the nasal airway was not materially faulty, the instrumental lavage of the antra and the sphenoids gave excellent results in cases of early closed sinusitis and in some cases of early open sinusitis, but that these results were sometimes temporary in closed sinusitis and generally temporary in open sinusitis. Further investigation seemed to show that recurrences took place, because the ethmoidal sinuses had not been emptied. The temporary

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

character of the improvement in both forms of sinusitis was more marked when there were gross deflections of the septum.

It was further found that the septal deflection could be remedied by resection without much fear of complications if, in closed cases of sinusitis, the sinuses and the septum were dealt with surgically at one operation. In open sinusitis, however, resection of the septum was very apt to lead to complications, whether the sinuses were dealt with or were left untreated.

From the observations on the liability of the ethmoidal sinuses to lead to reinfection of the other sinuses it was clear that I could not carry on the investigation unless I found a means of emptying the ethmoid sinuses. This could not be done by instrumental methods, and it was to mechanical methods that I had to look for a solution of the problem.

I tried the Proetz method of displacement and, though it filled the sinuses, I could not empty them efficiently. I found that if fluid was hurried through the nose it brought away a certain quantity of pus but did not cleanse the sinuses. I therefore set to work to devise an apparatus which would do so.

I ultimately found a method by which a fountain of fluid could be caused to shoot through the ostium of the sinus in an artificial model of the nose. The fluid filled the sinus, and by altering the setting of the instrument the fluid was withdrawn.

The apparatus consists of a reservoir, the normal saline from which is led by a tube to one nostril, while from the other it is drawn into a bottle by the action of an electric aspirator, capable of removing not less than two cubic metres of air per minute.

[Mr. LOWNDES YATES had previously demonstrated the apparatus and shown the effect of the " vacuum douche " on patients, the noses of whom had been syringed to remove any secretion lying in the airway. On placing the nozzles of the apparatus in the nostrils the fluid was aspirated through the airway, but no further secretion was withdrawn until the controls were put in operation, when a quantity of secretion appeared in the bottles. Incorporated in the apparatus was an artificial model representing a nasal airway and a nasal sinus, and until the controls were put in operation the fluid remained exclusively in the " airway " of the model.

When the controls were used the fluid passed to a higher level than the airway and shot like a fountain through the " ostium " of the " sinus " and was again withdrawn on altering the control.]

The apparatus works on the principle that if fluid is flowing under negative pressure through the nose and the negative pressure is suddenly stopped the fluid will gradually assume an atmospheric pressure and the air contracting in the sinuses will draw in any fluid which is in contact with their ostia, and on reproducing the negative pressure the fluid will be withdrawn if a portion of the sinus lies

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

above the ostium. The filling of the sinuses takes place in a manner similar to that of Proetz, but the position in which the patient holds his head during the douching permits the sinuses to be emptied, after being filled, so that repetition of this cycle enables them to be cleansed of secretion. A diagram of the nose is shown in the accompanying figures.

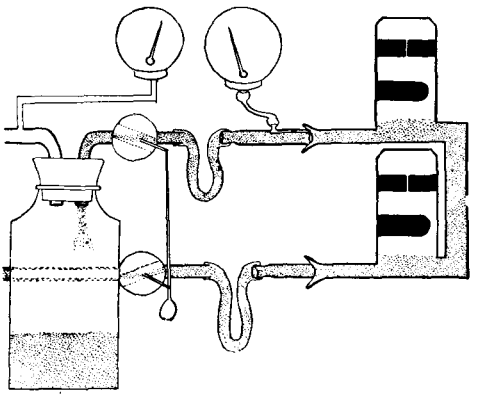


FIG. 1.

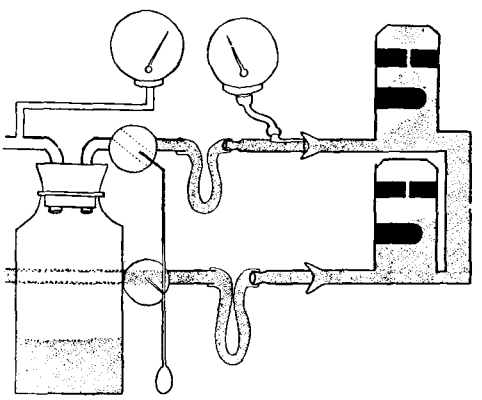


FIG. 2.

In Fig. 1, the fluid is shown flowing through the nose under negative pressure and it is seen to be confined to the airway.

In Fig. 2, the negative pressure has been stopped and the fluid in the airway is increased in volume from the reservoir and under the influence of the negative pressure in the sinuses is fountaining through the ostium of the sinus. On turning the controls into the position shown in Fig. 1, the fluid is withdrawn from the sinus, this filling and emptying being, in practice, repeated five times a minute.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

I then continued the investigation with this vacuum douche, and found that in states of open sinusitis of both forms the sinuses were cleansed efficiently and that much benefit resulted, though in some cases liquid paraffin had to be substituted for the saline. In closed sinusitis the degree of closure of the ostium when the mucous membrane was contracted with cocaine was a determining factor which decided the success of treatment, but in cases in which the ostium could be rendered open and the mucous membrane was irrecoverable, operation was essential.

I will give two examples of cases out of the four hundred which were treated. A patient who was suffering from arthritis was sent for investigation, having only trivial nasal symptoms. Examination of the nasal passages and nasopharynx showed little, but the vacuum douche removed over an ounce of pus on the first occasion, half an ounce upon the next, and on the fourth treatment no discharge was withdrawn and the patient then recovered from the arthritis.

I saw many cases in which instrumental lavage of the antra has been repeated, but discharge continued until the vacuum douche was used to empty the ethmoids, when the condition cleared up. In several cases an efficient operation on the antrum had been carried out, but the discharge continued. In one with a history of twelve years after a very efficient Caldwell-Luc operation, the vacuum douche brought away an ounce of pus from the ethmoids, and the discharge ceased after four treatments by this method.

In other cases the vacuum douche has been entirely unsuccessful, and on successive applications the discharge has not diminished, proving the need of operation, which in such a case of closed sinusitis, must be of a radical nature. In open sinusitis operations did not give good results, and if a case of open sinusitis did not clear up 1 : 10,000 formalin was added to the saline, and this generally, though not quickly, effected a cure by producing a fibrosis of the mucous membrane. In open sinusitis with inactive cilia the formalin is unnecessary, as the vacuum douche will generally bring about cessation of the symptoms quickly.

Conclusions.—In closed sinusitis effective cleansing of the sinuses will cause a cure in the majority of early cases, such methods of cleansing can be used as tests as to the need of operative measures. If operative measures are decided on they should generally be radical: half-measures meet with no success. Cases of open sinusitis rarely require operative measures, and simple cleansing, together with some other form of treatment, will effect a cure. Closed sinusitis can be diagnosed from open sinusitis by examination of the nasal mucus, the bactericidal power of which should be investigated, for it is high in obstructive sinusitis and low in open sinusitis. The inflammation in obstructive sinusitis is maintained by closure of the ostium, and in open sinusitis by the nature of the

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

micro-organism. The use of the vacuum douche is contra-indicated in all acute conditions.

T. B. LAYTON: The reactions of the mucous membrane of the nasal sinuses in chronic inflammation are the suppurative and the polypoid. My remarks refer only to the former. The principle which applies to our subject to-day may be found in the paper by Lister in the *Lancet* for 1867, which initiated a change of thought and of practice that altered the expectation of life for mankind. It is that " an inflammation tends to get well by itself if the cause of irritation be removed". The details that I would put before you are those that I learnt from Hajek in 1912. They are remarkable, not merely in that practically every one of them has stood that test of time, but that hardly any new point has been discovered to supersede them.

Now the cause of the irritation of the mucous membrane in the condition that we are considering is the product of that inflammation puddling against the mucous membrane. The removal of this product forms then the whole of the local treatment. In the maxillary sinus the problem is easy; it is done by intermittent surgical drainage followed, if this is not successful, by an operation designed to secure permanent drainage, and it is strikingly successful. Suffice it to say that if we do our work properly in a case of uncomplicated chronic maxillary suppurative sinusitis, the patient will get well. When we pass from the maxillary to the other sinuses that open into the middle meatus the problem is as complex as it is simple with the maxillary sinus.

I believe that the great cause of failure in the past has been in thinking, talking, and acting upon the conception of " frontal sinusitis ". There is no such thing—and this is the only point that I have taught myself and did not learn from Hajek—it is always a fronto-ethmoiditis.

Anatomically, pathologically, and clinically, frontal sinusitis is no entity. Anatomically—because of some four flask-shaped cells, the frontal sinus is but one, which has happened to reach the vertical part of the frontal bone in the excursion of the whole group from the front end of the primitive semilunar groove: pathologically—because all four cells are involved; and clinically—because the separate intranasal treatment of the frontal sinus by the passage of a frontal sinus cannula is impossible except in a small number of persons whose anatomy is such that they will probably never develop a chronic inflammation in the cavity.

To allow recovery of these cells the pus must flow away through the natural openings, and the obstruction to this flow is the swelling of the mucous membrane of their lumina. Now this mucous membrane is inflamed and one cause of the irritation is the pus flowing through the openings from the mucous membrane of the

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

fronto-ethmoidal cells, but this is not the only cause. The pus flowing from the opening of the maxillary antrum is another and, because the maxillary sinus is the largest cell, this is the most potent. If, then, you stop the pus from the maxillary sinus from flowing over the middle meatus you remove the cause of the irritation of the inflammation of the mucous membrane around the opening of the fronto-nasal duct. The mucous membrane contracts down again, the pus escapes from the fronto-ethmoidal cells, the cause of irritation within the cells is thus removed, and the mucous membrane recovers. Therefore the key to fronto-ethmoidal suppuration is the maxillary sinus.

Intermittent drainage of the maxillary sinus may cure a fronto-ethmoiditis but if this does not do so in a reasonable time the products of inflammation of the maxillary sinus should be diverted from the middle to the inferior meatus. This will relieve the irritation of the mucous membrane at the front end of the semi-lunar groove.

Supposing we wash out the maxillary sinus four times at weekly intervals, allow one week to make the arrangements for the operation, three for the healing of the parts and another four weeks to see the effect of the diversion operation—it will be seen that no operation upon the middle meatus should be performed in any case of fronto-ethmoidal disease for three months after the diagnosis has been made.

Suppose by that time the patient is not well, the important thing to remember is that, if at this stage you do the wrong thing, the chance of ultimate recovery may be lost for ever. The moment you cut the mucous membrane scar-tissue will be formed and, as this contracts around an opening or in a duct, it narrows the lumen. If this scar-tissue is formed at the wrong place the hope of recovery is materially diminished.

Two operations should be considered. The first is the high removal of the middle turbinate. Hajek used to teach that this was necessary for the diagnosis of the majority of cases of frontal sinusitis. Since we have ceased to diagnose frontal from fronto-ethmoidal sinusitis it has become unnecessary for this purpose. It remains, however, the most important operation in the treatment of this condition because it causes but slight trauma and affords the best chance of giving drainage to all the fronto-ethmoidal cells. Let it be remembered that however intimately you study the varying anatomy of the nasal sinuses, you are no further on in your knowledge of the arrangement of the cells in the patient before you.

The other operation is that upon a high deviation of the septum. Hajek used to teach that this was necessary as a preliminary to the high removal of the middle turbinate because you could not get your instruments up to the region of the latter until the former

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

operation had been done. I have found, however, that the septum operation may be all that is necessary by allowing the middle turbinate to fly back towards the midline and thus relieve the space beneath it.

If these still fail the next stage is to consider whether there is any operation peculiar to the case before you that you can devise to relieve the obstruction at the front end of the semilunar groove. No set operation should be considered, and all blind scrapping or pinching—whether with Hajek's ethmoidal hook or conchotome—should to-day be left undone. It replaces mucous membrane by scar-tissue. An attempt should be made to peel back a piece of mucous membrane from the obstruction, to remove the bone beneath, and to turn the flap into the opening so made, in order that an edge of cut mucous membrane opposes the surface of the flap. In this way alone can one be certain that the new opening will not close. In my opinion the future of operative rhinology is bound up in the conservation of the mucous membrane of the nose.

C. GILL-CAREY said that, technically, he agreed with Dr. Ferris Smith. About six years ago he had become dissatisfied with the results of intranasal operations on the ethmoid, and therefore he adopted the external method. So far as the ethmoid was concerned, the results were extremely good. With regard to the frontal sinus the results were good, but in a number of cases for only a limited period; a year or two afterwards reinfection and stenosis of the frontal sinus opening occurred. He had tried to remedy this by skin-grafting, but did not succeed. There was similar trouble with regard to the sphenoid; probably that was due to faulty technique.

He had operated upon a number of asthmatic patients with a similar technique, and the results were equally good, but lasted for a shorter time as far as the asthma was concerned. In these cases he felt that it was not infection which was causing changes in the sinus mucous membrane, but a typical allergic change in the nose, which affected not only the linings but the septum and the turbinates.

WALTER HOWARTH said that he was in substantial agreement with the technique of Dr. Ferris Smith, which was almost identical with that which he himself introduced in 1921 and had carried out in many cases since that date. There were, however, one or two points on which he differed from Dr. Ferris Smith. One was in regard to the mucous membrane and its treatment. He understood Dr. Ferris Smith to say that he had never found in these cases a mucous membrane which was fit to leave behind, and that he operated not only on the ethmoid and the frontal sinuses, but on the sphenoid also at the same time, which meant that every case was regarded as one of pan-sinusitis. In this country such virulent types were not always encountered, as he (the speaker) saw many cases of fronto-ethmoidal disease in which the sphenoid was not involved,

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

and he thought there were many cases of fronto-ethmoidal suppuration in which the frontal sinus mucosa was not full of the abscesses with underlying osteitis, which had been mentioned. He thought the mucous membrane of the frontal sinus should not be removed in every case ; if it could be left behind, so much the better. The upper part of the mucous membrane was not usually very markedly affected ; it was the lower part, in the region of the fronto-nasal duct, which was so much swollen and congested. The operation performed by Dr. Ferris Smith and himself was that of complete exenteration of every portion of the ethmoid. He would like to leave some of the ethmoid behind, if the mucous membrane could regenerate, but it was so small that one must agree to get rid of every portion of the ethmoid. In removing the floor of the frontal sinus one removed a considerable portion of mucous membrane which formed the fronto-nasal duct, but it was not necessary to remove all the mucosa. In the maxillary antrum the ciliated epithelium regenerated, but he did not know that such was the case in the frontal sinus. He suggested that it would be more reasonable to leave the mucosa if it was not very grossly diseased.

His difficulty in curing these cases had been mainly that of maintenance of the patency of the new fronto-nasal duct which was formed, and he, like Mr. Gill-Carey, had had patients who returned two or three years afterwards on account of recurrence of the symptoms, having been symptom-free in the interval. Since he had been using skin-grafts his results had been better ; openings had more easily remained patent, and freedom from symptoms had been more definite.

H. G. Bedford Russell : Dr. Ferris Smith's presentation of his operation, with its insistence on visibility and a bloodless field, is really the first one to appeal to surgeons and rhinologists alike.

I have been trying this operation for some months and can endorse the claims for its remarkable freedom from post-operative distress, and from the production of an obtrusive scar.

I can conceive that the healing process in the sphenoid and ethmoidal regions might produce a covering of columnar ciliated epithelium from neighbouring parts, but in the main portion of the frontal sinus I take it that the barrier constituted by the skin-graft negatives any such invasion ; and that the possibilities lie between an obliteration of the cavity by a sclerotic process and the persistence of a cavity lined with squamous epithelium.

The operation may be employed with advantage in the treatment of anterior sinusitis only (when the essential trouble is mere mechanical difficulty in ventilation or drainage of a frontal sinus) without bothering about the posterior group at all.

It may not be out of place here to make a preliminary report upon another plastic operation which I have been carrying out for

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

the past sixteen years on the frontal sinus. It consists of the removal of the anterior part of the bone enclosing the fronto-nasal duct, without transgressing the membranous lining, and I have become more fond of it since I found that its performance is facilitated by the use of Ferris Smith's retractor and by following his practice not to use a chisel.

In cases in which I have been able to preserve the integrity of the mucous membrane, I have found that the aseptic scar which results is literally invisible, but even when one has come short of perfection in this respect, one can ensure a satisfactory scar by drying the wound and soaking it with hexylresorcinol. Contamination is unavoidable in the rather large percentage of cases in which the obstruction to frontal ventilation is caused not merely by bone constricting the duct but by the presence of a fronto-ethmoidal cell which has bulged backwards. In this case one removes the bone enclosing the duct and also the bone forming the bed of the offending cell; and having treated the wound as above described, one cuts off the whole membranous cell at its junction with the duct. In cases in which it is impossible to pass a cannula at the beginning of the operation, it is easy to pass the largest afterwards. Patency has persisted in all my cases, as would be expected in view of the fact that the lumen is nowhere denuded of epithelium, so that stenosis by scar-tissue formation is avoided. It makes no claim to cure the sinusitis—either of the frontal or the neighbouring cells, but it does cure the cardinal symptom of pain, and it readily—and apparently permanently—permits of lavage afterwards, which helps somewhat in the matter of catarrh.

G. H. HOWELLS said in his work at the Royal London Ophthalmic Hospital he had been dealing with cases having orbital complications for which some radical measure had been required. He had employed Mr. Howarth's technique, and, so far, he had been satisfied with the results. He agreed with Mr. Howarth that, in many cases, it was unnecessary to denude the frontal mucous membrane. Often he had found that the upper and back part of the mucosa could be left. With regard to the ethmoid, he had removed all the membrane and the cells.

In dealing with the antrum he thought the operator should endeavour to be conservative and try the intranasal procedure before deciding on a Caldwell-Luc or more severe operation. As to stenosis of the fronto-nasal duct after operation: if one removed a portion of the nasal process of the maxilla, the opening afterwards was less likely to stenose, and an occasional touch with caustic during convalescence sufficed to keep it patent. He had not had much experience in skin-grafting these cavities after operation; he was trying it in some cases, and he hoped to obtain better results in regard to the patency of the duct.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

E. WATSON-WILLIAMS said that one material objection to all methods involving an external approach through the skin of the face was that the majority of patients refused to consider any such measures unless the condition was sufficiently grave to make life intolerable. The first point on which they required reassurance when the question of operation was raised was that no external incision would be needed, even though they could be persuaded that the scar was so inconspicuous as to be practically invisible.

In the second place, the need for such an operation seldom arose. Most cases of chronic sinusitis could be treated satisfactorily by intranasal methods. The essence of this was, as Mr. Layton had said, to respect the mucous membrane, especially that of the turbinate. The inferior turbinate should never be removed, and rarely needed to be touched. The middle turbinate could nearly always be conserved, or at most only a small part needed removal to gain access to the anterior ethmoidal cells, and the remainder of the cells could be opened by passing beneath the intact turbinate. It was true that when dealing with old-standing, gross polypoid disease of the ethmoid, a more extensive removal might be demanded, but even here every effort ought to be made to conserve as much as possible of this physiologically important structure. The worst cases of chronic suffering from sinusitis were those in which there had been extensive or complete removal of turbinate tissue, in an unwise attempt to get rid of the diseased part. This led to drying of the pharynx, and in the nose the formation of scabs, tenacious inspissated mucus, usually wrongly described as pus, with aching and great discomfort. The ideal was free opening of the cells, for the purpose of drainage and ventilation, and if this were achieved the diseased mucous membrane would become healthy.

HERBERT TILLEY said that it was open to doubt whether the majority of patients in this country would submit to such a radical procedure except under a general anæsthetic, which was now frequently administered when the patient was already in a deep sleep, secured by the administration of such hypnotics as nembutal or avertin.

He was glad to be assured that Dr. Ferris Smith reserved his external operation for such cases as had not been considerably relieved or even cured by intranasal procedures, because it must be within the experience of many surgeons that a large proportion of chronic inflammatory lesions in the higher sinuses could be satisfactorily dealt with by endonasal surgery.

On the other hand, when failure attended this method of approach, Dr. Ferris Smith's external operation would seem to provide more prospect of success.

J. F. O'MALLEY said he understood that the fundamental point of the opener was the eradication of persisting osteitis, a condition

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

which was the result of long chronicity. He would like to hear whether that really was the point emphasized, because operators in this country had mostly concentrated on the intranasal ethmoid operation. He had himself operated upon between 500 and 600 such cases during the last twenty-five years, and, in a great measure, he had been satisfied with the results. Now and again, however, he knew that some cell had escaped him, and the external operation had been needed subsequently. In a large cavity like the antrum there was relatively little osteitis apart from dental disease, but small sinuses like those of the ethmoid could be regarded from the same standpoint as the cells of the mastoid. There were thin bony walls, crowded into a cramped space, and so the inflammation wrought havoc, and resulted in osteitis much more than in the case of larger spaces. At first it was relatively soft, but if it persisted for years there was sclerosis. Hence in dealing with that aspect he feared that failure arose more from under-operating than from carrying out a more extensive procedure.

Dr. FERRIS SMITH (in reply) said it had been one of his endeavours to define the type of case on which he did the operation he had been describing, but apparently he had failed to make that clear. He proposed to reply to the speakers in a general way.

Mr. HOWARTH had raised the question of operating on all the sinuses at once. But he must allow proper judgment ; one did not operate on a frontal sinus which had a proper lining by this method of approach. By confining the operation to the frontal sinus and the ethmoid Mr. Howarth might be neglecting the sphenoidal sinus. The pathological state of the particular case determines the approach. There were a number of cases in which not all the sinuses needed to be operated upon ; such a case was that on which he had operated on the previous afternoon.

When he said that he had never seen a mucous membrane which was fit to leave behind, he was not referring to the ordinary case which was still air-containing ; such a case was one for therapeutic management, not for surgery. But one could not expect argyrol to cure a chronically diseased ethmoidal sinus, as the solution did not reach the diseased site. In the case of the normal nose he could put in argyrol packs, a second and a third, and could demonstrate a copious catarrhal discharge. In his own practice a careful study was made of the case locally, every means of arriving at a correct diagnosis being employed, including X-rays, and a decision was reached as to whether a given cell or a group of cells was air-containing or not. There were borderline cases in which one could not be certain. When cells were found to be air-containing, therapeutic management was the rule. When there was a small amount of air in the cells, the patients were given the benefit of a month or six weeks' therapeutic management.

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

With regard to the type of surgery employed, that depended on the pathology of the case. He was sure that the sinus case in America did not differ from the sinus case in London. That morning he had performed an operation on a woman who had been *successfully* operated upon twenty-one times, yet her sphenoidal sinus had not been opened. In that case there had been no X-ray study, and the anterior sphenoid wall was very dense. He would not feel justified in breaking through that wall without having a preliminary skiagram taken. The woman was still suffering from her original complaint. It was of that type of case that he had been speaking, one which had a gross pathology, the kind of case described by Dr. Pickworth, of the Birmingham Mental Hospital, in which osteitis and periostitis were present, with extension of bacteria, and all the changes consequent upon that condition. At his home many of these cases were encountered, and he was sure there were many also in England ; during the great war he had seen many such in this country among his patients. He still contended that one was not warranted in leaving behind any part of the membrane in a sinus cavity, because if the operator would remove the membrane and carefully examine it afterwards he would see support for his action.

He was not able to agree with the contention that removal of the middle turbinate was a cause of crusting in the nose. The crusting in the nose was due to failure to remove the diseased structures. He had looked into several hundreds of these noses at various periods, and he would be pleased to match the cases he had been referring to with those dealt with by those who adopted more conservative measures. A large percentage of the cases he dealt with had already been operated upon one or more times before they came to him, sometimes by distinguished men. In one case he saw in London there was a narrow ethmoid cell running one-third the length of the cribriform plate, filled with pus. He had no instrument which he could get into that cell and no one could open it intranasally ; even if he could, it would not be emptied. Periorbital ethmoidal cells were frequently diseased. When they were involved they were continually giving trouble.

It was suggested by one speaker that he had a gloomy outlook on chronic sinus conditions. It had not been his intention to convey such an outlook to his hearers, but to the patients it was a gloomy situation. He was sure that some of the London patients who had had two or three operations were dissatisfied, because they had told him so ; some said they would submit to operation of any kind only once more.

He could not definitely state the age of the youngest patient on whom he had performed the operation. Occasionally he used the periorbital approach on a young person, though it was rare to see the chronic process under twenty years of age. He had seen

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press

people aged seventeen who had had polypi removed on several occasions.

In the case of the patient with osteitis, on whom he had operated that morning, the bone was rough, oozed on the surface, and was very tender to even slight pressure. That bone was not removed, but the covering granulations were taken off. It was saturated with picric acid acetone. He had seen, at a *post mortem* examination on another patient, the stain on the dura after it had been applied on the sphenoid.

He did not think any operator was justified in entering the sphenoid without being able to see its walls; it was a dangerous area. Operators had been taught to leave the sphenoid membrane alone, but that was not compatible with the advice to remove the membrane in the antrum. If the sphenoid was chronically diseased, the lining must be removed under proper vision. After his experience nothing could now deter him from the approach which he had described in the type of case under discussion.

ABSTRACTS

EAR

Sound Reflexes in the Rabbit. PIETRO TULLIO and GIORGIO ROSSI. (*L'Otorinolaringologia Italiana*, January, 1935.)

The authors have conducted a series of experiments in which sound has been led directly to a single opened semicircular canal in a rabbit and the resulting phenomenon studied. Rossi describes very carefully the technique of exposing and opening the various canals. In the rabbit there is a space known as the mastoid fossa, with four triangular walls. One of these—the floor—contains part of the external canal. The posterior wall contains the upper part of the posterior canal, and the antero-median wall contains the anterior part of the superior canal. Having exposed this fossa it is a simple matter to open the required canal. To expose the superior canal satisfactorily a small portion of the cerebellum has to be removed, but this does not appear to alter the equilibration of the animal.

In different animals different canals are opened, only one side being used, a technical point being that the left side is much easier to work on than the right.

Sound is led to the ear from a Galton-Edelmann whistle. When sound stimulates a canal there is a deviation of the head and a nystagmus. Sound applied to the open horizontal canal produces

https://doi.org/10.1017/S0022215100041608 Published online by Cambridge University Press